Problems of the Mechanization of USSR Agriculture

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PROBLEMS OF COMPLETE AGRICULTURAL MECHANIZATION IN THE USSR

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The material-technical base of socialist agriculture necessary for developing agriculture and livestock raising, is constantly being improved and strengthened. During the last 3 years socialist industry provided agriculture with more than 467,000 tractors (in terms of 15-horsepower units), 128,000 grain-harvesting combines, 64,000 of which were self-propelled, 205,000 trucks, and more than 5.3 million trailer implements and other agricultural machines.

The further technical progress of socialist agriculture is directly dependent on economic law that production relations must necessarily conform to the nature of productive forces. The range of machine application in the USSR, both in industry and agriculture, is not restricted. In a society where the fundamental purpose of machines is to save and lighten labor, where the right to work is guaranteed to each person by the Constitution, where the introduction of new machines does not force anyone out of production, but rather assists in the gurther growth of labor productivity -- in such a society people show great interest in machine utilization; they very willingly master their operation and strive to use them to the maximum advantage for society.

Collectivization of the peasant economy is the decisive prerequisite in the technical reequipment of agricultural production.

"The great importance of the kolkhozes is precisely the fact," says Comrade Stalin, "that they provide the fundamental base for the use of machines and tractors in agriculture..." (I. V. Stalin, Collected Works, Vol 12, page 165.

As a result of successful and consistent advances during the Stalin plan for industrialization of the country, conditions have been created which made it possible to mechanize agriculture and to supply agricultural production, conforming to the new kolkhoze system in the country, from a modern, materiali-technical base. One of the most important phases of socialist rural reconstruction, at the beginning of collectivization, was providing agriculture with first-rate technical equipment. By the end of the second prewar Stalin Five-Year Plan, reconstruction of socialist agriculture on the basis of new, modern technology was virtually completed. "Soviet agriculture," said Comrade Stalin at the XVIII Party Congress in 1939, "is, therefore, not only of large-scale and more highly mechanized, which means that its production of agricultural commodities is higher, but it is also better equipped with modern know-how, than agriculture in any other country. (I. Stalin, Problems of Leninism, 11th Edition, page 582.)

The question of complete agricultural mechanization arose next. At the XVIII Party Congress it was decided: "To achieve complete agricultural mechanization in the Third Five-Year Plan; to fully satisfy the trailer implement stock requirements of agriculture in keeping with the types of tractors in the fleet available; to introduce advanced agricultural engineering on a large scale while scientifically using the wealth of practical experience of

leading agricultural workers; to focus attention on mechanizing the labor-consuming processes of livestock raising on the sovkhozes and kolkhozes; to develop extensively the construction of small kolkhoz hydroelectric stations, wind-mill drive and gas-generator powered electric power stations using local fuel." (VKP(b), The Resolutions and Decisions of the Congresses, Conferences, and Plenums of the Central Committee, Number II, 1941, page 735.)

Complete mechanization of agricultural production is a great task before the national economy. Not only in old capitalist Russia with its backward agriculture but also in contemporary capitalist countries, everything noted by V. I. Lenin at the beginning of the Twentieth Century is still taking place; that is, with regard to the stage of its productive power, capitalist agriculture continues, on the whole, to be in the "manufacturing" stage of development, i.e., manual labor still predominates. This points up the inherent rule in capitalism that agriculture lags behind the developmental rate and technical level of industrial production. In the United States, the most highly developed capitalist country, agriculture employes a vast number of modern machines, tractors, combines, etc. However not more than one-third of American farms use tractors. About 27 percent of American farms have neither tractors nor draft animals. They are forced to resort to hiring tractive power, which leads to the enslavement of the small farmers, to their impoverishment and ruin. Almost 11 percent of American farms have only one horse or one mule. ("Farm Implement News", No 10, July 1950.)

Capitalism is characterized by the wastefulness of its productive forces. Mercilessly exploiting the working masses of the mother country, the colonies, and dependent countries to insure maximum profits, monopoly capital dooms the majority of the population of capitalist and dependent countries to extreme poverty, and undermines, drains, and exhausts the physical and spiritual strength of the laboring masses. Inherent in the system of monopoly capitalism is the destruction of material wealth and huge profits, especially in the period of crises and imperialist wars. This applies to the agricultural sector of the economy and to the matter under consideration, and it fully demonstrates the poor regulation of agricultural-machine building in capitalist countries. Competition between capitalist firms producing agricultural machines and implements leads to excessive multi-brand production, and prohibits the interchangeability of spare parts and individual units; consequently, the machine owner is forced to buy spare parts from a certain firm, etc. Further, machine and tool production in capitalist agriculture reflects the plundering and rapacious way in which such agriculture is carried on (small furrowing tools, etc).

Economical expenditure of material wealth and the economical relation to productive force are inherent in the socialist system, while the steady increase in the material and cultural living standard of the workers, based on the development of all kinds of social production, is the law of socialist society. Technical progress in the USSR rests on the idea of economizing on labor and on making tasks as easy as possible. In socialist agricultural production this is expressed by the standardization and general application of machines and tools, and in the creation of a park of com-

posite machines.

The tremendous advantage of socialist production is in the standardization of agricultural machines. Within the scope of each bank of agricultural machines, which is determined on the basis of identical productive use, only those types are manufactured which most nearly answer the purpose. This affords economy of social labor, both in the production of machines and in their operation and repair.

Capitalist agriculture is characterized by the very narrow specialization of the various economic branches and regions, leading to single-crop production, which can be seen in its technical progress. The overwhelming majority of machines used in capitalist agriculture are very highly specialized.

Inherent in socialist agricultural enterprises is the many-sided development of the economy, as is the complete development of the various agricultural regions. This creates the necessary material conditions for machine and tool standardization, and also promotes the productive use of machines, since it increases their operation time during a season.

Combines are the most widely-used machines in socialist agriculture. Agricultural combines are based on the principles of the simultaneous combination of a number of operations, made possible by agricultural engineering technology. Moreover, it allows a remarkable saving of time, labor, and material, the disbursement of agricultural jobs, and raises the quality of productive labor. The greatest number of diverse jobs are performed by harvesting com-

bines. Consequently, a modern grain-harvesting combine performs consecutively the reaping, threshing, and screening of the grain, divides the yield, and shocks the straw and chaff.

The high production in the USSR is a result of the favorable conditions for the use of wide-sweeping machines and tools. The use of these machines exerts a great influence on increasing the productivity of labor, since it decreases the number of workers engaged in specific tasks, improves the quality of work, and reduces material expenditures.

Self-propelled agricultural machines, posessing great productiveness, maneuverability, and a high coefficient in the use of motive power, are extensively employed. The use of these machines acquires special significance in the development of rural electrification. The number of rural power stations at the present time is some 9,000, with a total power exceeding a million kilowatts. The number of electric motors used in the country is increasing constantly. Each electrified kolkhoze has at least 15 to 20 electric motors. The expansion of high- and low-voltage networks designated for the service of rural areas is rapidly taking place. More than 60 percent of the electrical energy input in the country is used for productive purposes, mainly for the accomplishment of specific tasks.

The most important instruments by which the State controls the kolkhozes are the MTS. The MTS play the determining role with regard to the complete internal mechanization of the agricultural sector of the economy.

The most essential characteristic in the makeup of socialist agriculture's material-technical base is that the most important machines and tools of agricultural production (tractors, combines, the complex group of trailer-tractor implements, grain-screening machines, etc) are the property of the state and are used either directly on large-scale agricultural enterprises -- sovkhozes, or throughout the extensive system of machine-tractor and specialized stations on the fields of the kolkhozes. In such a manner, the greatest, and in addition, the determining portion of the material-technical base in socialist agriculture remains State of public property, and therefore, in agriculture as in industry, the condition and the development level of the material-technical base depend first of all upon the socialist state.

At least nine-tenths of all agricultural production takes place on that part of the kolkhozes on which all the field work is performed by the MTS. Moreover, the MTS are obligated to mechanize the food gathering process (fodder preparation and ensilage), and also a number of livestock raising labor processes, for example, the construction of wells, operation of electric-shearing devices, etc. The principal facilites for mechanizing such work processes are acquired and operated directly by the kolkhozes. Yet here, too, the MTS carry out the responsible role of installing equipment and of rendering technical advice to the kolkhozes with regard to the use of all types of mechanization. There is a constantly growing network of specialized livestock machine stations for pasture and open field farming. Twenty seven such stations were set up in Kazakhstan from 1950 to 1952. Other specialized MTS help expand the network, for example, meadow-development and forest

preservation stations. Machine-improvement squads are organized in many MTS. The MTS are equipped with machines for building dams, reservoirs, dikes and canals, for construction of new irrigation systems, road construction, etc.

In 1951 the MTS and speicialized stations performed more than two-thirds of all the field work on the kolkhozes. Tractors performed almost all of the plowing and three-qurters of the sowing; combines harvested more than 60 percent of all grain crop areas. The grain area harvested by combines consisted of 85 to 95 percent of all harvesting areas in the basic grain regions of the country. There are already many such regions in the country, where nearly all the kolkhoz field work is done by machines of the MTS. Consequently, the level of mechanization of plowing and sowing on Kuban kolkhozes in 1951 amounted to 99 percent, the mechanized harvesting of grains (heads) and millet -- 92 percent, of sunflowers -- 99.9 percent. A similar mechanization level is attained on the kolkhozes in the Southern Ukraine, Siberia, and Povolzh'ye. Currently, there are many MTS which, on the basis of tractorization, perform all the field work on the kolkhozes they service, and where, therefore, field work is completely mechanized. We shall cite facts about field work mechanization on the kolkhozes serviced by the Sovetskaya MTS Krasnodar Kray:

Type of Work	Tasks performed by tractors (in percent)			
	1948	1949	1950	1951
All field work	91.5	95.8	98.2	99.1
Subdivided into:				
Post harvest husking	100.0	100.0	100.0	100.0
Disk plowing	99.1	99.5	100.0	100.0
Disking and working of fallow	100.0	100.0	100.0	100.0

Spring plowing	99.2	99.5	99.8	99.8
Pre-sowing cultivation	100.0	100.0	100.0	100.0
Spring sowing	92.3	94.6	96.4	98.5
Winter sowing	99.0	99.5	100.0	100.0
Furrow cultivation	98.2	99.6	100.0	100.0
Grains and sunflowers	80.4	85.2	97.1	98.3

This Sovetskaya MTS serves three consolidated kolkhozes with a total plowed-field area of 24,000 hectares. The table indicates that during the last 4 years, mechanization of all the field work was virtually completed on the kolkhozes serviced by the Sovetskaya MTS. Moreover, the volume of tractor work of this MTS, during a specified period, increased from 65,000 to 87,000 hectares of mild plowing, i.e., more than 30 percent. Lagging somewhat behind is the mechanization level of work processes in separating, classifiying, and shipping grain. The MTS are taking measures to completely mechanize threshing and thus insure complete mechanization of this type of work.

The volume of tractor work performed by the MTS in the country as a whole increases from year to year, and in 1951 it was almost 70 percent higher than in 1940. According to the data of the TsSU, the average increase in the volume of tractor work during the three years (1949 - 1951) was 18 - 19 percent. Estimates indicate that at these rates, and with further development of technical agricultural equipment, the complete mechanization of field work in our country will be fully realized in the near future.

In order to achieve this, socialist industry must, in the first place, speed up the mass production of machines, on the basis

of the success of past experiments, especially harvesters and combines for various types of cultivation, meadow-improving, soil-preparing, intricate grain-screening machines, conveyors, etc. It is essential also to perfect and speed construction of new machines for the mechanization of labor-consuming work in agriculture and livestock rasing. In the second place, it is necessary to improve the work of the MTS and to insure a still greater productive use of the available bank of machines. In the third place, it is necessary to utilize, more generally, the advanced experience of the best agricultural mechanizers and well -known experts on mechanical field cultivation and high harvests, and also the advanced experience in mechanizing labor-consuming work on cattle farms.

The solution of the main agricultural problem -- great increase in the productivity of cultivated areas, and the rapid increase in livestock with, at the same time, great growth of its productivity -- demands that much attention be given to the matter of complete agricultural mechanization. Increase in the productivity of agricultural labor, further development of all agricultural branches, and a productive increase in farm crops and in livestock products will be insured precisely by introducing every type of mechanization into all agricultural branches.

Such MTS, as for example, the Sovetskaya Krasnodar Kray, which essentially have already completed field-production mechanization while applying all the new methods and adhering to all the requirements of agricultural science (deep ploughing, cross bed

or narrow-furrow sowing, etc.) raise their productivity from year to year and guarantee the fulfillment of planned tasks, both in total grain yield, and in the development of public livestock raising.

According to the accepted government decision, appraisal of the activity of each MTS must be afforded first of all on the basis of how the MTS in question in fulfilling planned state tasks with regard to productive capacity.

We shall compare planned state tasks received by the Sovetskaya MTS, and data concerning their fulfillment. As is known, average data of several year's standing, obliterating the influence of a chance variety of circumstances, more accurately and fully reflects agriculture's developmental process, exposing that which is securely achieved and which expresses the determining trend of development.

Below we cite composit data for the last 4 years (1948 - 1951) using the Sovetskaya MTS as our model:

The State Plan of tractor work (in thousands of hectares of shallow plowing) 264.4

Obligations of the MTS under contract with the kolkhozes:

Total (in thousands of hectares of shallow plowing	264.4
Percentage of the State planned work	100.0

Fulfillment of the tractor work plan:

Total (in thousands of hectares of shallow plowing)	301.7
Percentage of the State planned task	114.1

Percentage of obligations to the kolkhozes 114.1

Total yield with reference to the State planned yielding capacity:

Of all grain crops (in thousands of centners) 952.2

Of sunflowers (in thousands of centners) 131.8

Total yield (in actual facts):

Of all grain crops (in thousands of centners) 963.3

Percentage of plan 101.1

Of sunflowers (in thousands of centners) 129.8

Percentage of plan 98.5

These figures indicate that the Sovetskaya MTS is carrying on a persistent struggle for fulfillment of planned State tasks.

With regard to the volume of tractor work contracted for with the kolkhozes, it not only fulfills, but overfulfills the State plan for this work (14.1 percent for four years). On the kolkhozes in the area serviced by this MTS, productive capacity actually corresponds to the plan. The Sovetskaya MTS collected 11,000 centners of grain more than the plan specified, but several kolkhozes underfulfilled the plan in sunflower yield. During the four years an average of 16.7 centners per hectare was collected instead of the planned 17 centners. Successes in crop production also condition the developmental rates of livestock breeding. The Three-Year Plan for developing social, ~~productive~~ livestock raising on the kolkhozes serviced by the Sovetskaya MTS was fulfilled ahead of schedule.

We shall cite appropriate facts for 1 October 1951 (percentage of plan):

Three-Year Plan 1949-1951

	Large-horned cattle	Swine	Sheep	Dairy Cattle in terms of Large-horned cattle
Imeni Zhdanov	101.4	111.3	124.2	108.4
Imeni Molotov	118.5	157.2	122.0	131.4
Imeni Lenin	101.4	137.5	127.1	117.8
Entire zone of the Sovetskaya MTS	107.3	140.5	124.8	121.0

Compulsory livestock minimum at end of 1953

	Large-horned cattle	Swine	Sheep	Dairy cattle in terms of Large-horned cattle
Imeni Zhdanov	103.0	95.4	113.7	102.6
Imeni Molotov	103.6	132.3	105.5	113.2
Imeni Lenin	89.8	177.4	126.0	118.6
Entire zone of the Sovetskaya MTS	96.8	143.0	116.3	113.8

On 1 October 1951 all kolkhozes in the zone serviced by the Sovetskaya MTS had overfulfilled the three-year plan to develop social, productive livestock raising in each type of livestock, and in the herd as a whole (in terms of large-horned cattle) -- 21 percent. Moreover, in the herd as a whole (In terms of large-horned cattle) the kolkhozes in the zone serviced by the Sovetskaya MTS overfulfilled the State compulsory livestock minimum, 13.8 percent, set for the end of 1953, i.e., more than two years before the deadline. Consequently, the Sovetskaya MTS, in the struggle to solve the main agricultural problem, achieved decisive successes in increasing the productivity of agriculture and in increasing livestock. The remarkable growth in the productivity of livestock

raising was secured only by mechanizing labor-consuming tasks, fodder procurement in particular.

The (MTS) and specialized stations significantly broadened the sphere of their activities in 1951 and achieved well-known successes in adapting new processes of agricultural science and in mechanizing a number of important jobs. The (MTS) in 1951 husked stubble on 6.6 million hectares more than in 1950, used tractors to harvest hay on an area 8.1 million hectares larger than in 1950. In 1951 the (MTS) conducted cross-sowing of grain crops on an area of more than 5 million hectares and deep-plowed an area of more than 15 million hectares, widely utilizing the square nest method of sowing furrow-plowed cultivations.

In 1952, further expansion of the production activities of the (MTS) was projected by the State plan for agricultural development. The volume of tractor work increased 38.5 million hectares in comparison with 1951, and in 1952 consisted of upwards of 423 million hectares (in terms of shallow plowing). The degree of mechanization of spring sowing rose to 78 percent, winter sowing 88 percent, and of all sowing work 82 percent, combine grain harvesting 72 percent, combine harvesting of sunflowers 90 percent, and digging of garden beets 90 percent. The crushing (tousling) of flax will be 57 percent mechanized, hay mowing 41 percent, and fodder ensilage 58 percent. The role of the (MTS) in the development of livestock raising is increasing remarkably. The (MTS) must strengthen mechanization of fodder procurement and of labor-consuming tasks on cattle farms, while also expanding their technical assistance to kolkhozes in installing equipment, managing its use, and in plant construction.

All this demands further improvement in the work of the MTS and specialized stations in order that the kolkhozes might accomplish unconditional fulfillment of planned tasks with regard to the crop yield and fodder production required by social livestock raising, that they might eliminate serious deficiencies in tractor and agricultural machine utilization, and might better organize machine repair and technical maintenance. The movement of agricultural mechanizers for high yields, high productive use of machines, and economical expenditure of resources (fuel, spare parts, repair materials, etc) has assumed large-scale proportions during the past few years.

Included in the solution of the problem of the complete agricultural mechanization, as a practical problem of the near future, are the broad strata of agricultural workers in all rayons, oblasts, krays, and republics.

668 of the consolidated kolkhozes of Kuban have undertaken the obligation to virtually complete mechanization in the next two to three years, and to insure high, steady productivity: winter wheat not less than 26 centners per hectare, summer wheat 20 centners, sunflowers 20 centners, corn 27 centners, rice 40 centners, etc. In the regions of livestock raising they have undertaken to achieve an average milk yield per cow of not less than 2,100 kilograms, and a shearing from one fine-wooled sheep of not less than 4.6 kilograms.

The grain growers of Kurgan Kray, pioneers in the movement for rapid realization of complete agricultural mechanization in Kuban, undertook to fulfill the tasks of mechanization in two years,

i. e., prematurely, 1952 and 1953 -- to mechanize completely plowing, harrowing, sowing, cultivating and harvesting of grains, corn, sunflowers, castor plants, hemp, rice, and the planting of tobacco; to mechanize the separating, weighing, drying and freight handling of grain; to mechanize (75 percent) grain shipment in cars; to construct cemented or asphalted areas on each thrashing floor.

Not less than 28 centners of winter wheat, the regions main cultivated crop, per hectare from all areas, and not less than 33 centners per hectare from an area of 3500 hectares, was included in the struggle for productivity in 1952 by the industrious agricultural workers of the Kurgan Kray.

Formerly the mechanization of agricultural production lagged behind that of industrial production, but today the Soviet system and collectivization of agriculture have made it possible to overcome this lag. However, time was required for mechanizing the most important processes in all the branches of agricultural production. First of all, it was necessary to solve a number of complicated technical problems related to the development of various entirely new automatic machines, types which were never used before. The war interrupted fulfillment of these tasks. Only toward the end of the first postwar Stalin Five-Year Plan when reconstruction of the economy had been successfully completed, after a number of important regions of the country had been sapped by the temporary occupation, did they succeed in broadly expanding the work of establishing a system of machines for complete agricultural mechanization. At the present time, complete mechanization has taken root in all branches of agriculture in the USSR.

It is possible to distinguish four basic phases of the agricultural production process: (1) soil preparation; (2) sowing or planting; (3) crop treatment; (4) crop harvesting. In turn, each of these phases is divided into a number of separate, isolated, significantly important operations, the number and type of which depend on the agrotechnical cultivation methods for individual crops. Different crops or groups of crops require different soil processing, sowing methods and crop treatment. Harvesting is carried on at different times and by various methods. For the cultivation of each crop or crop family an appropriate bank of machines is necessary which meets, precisely, all the requirements of agricultural engineering.

Carrying out, step by step, through the use of machines, all the individual operations in each phase of the productive process, is the very essence of complete agricultural mechanization. For example, in the soil processing stage and its preparation for sowing, shallow plowing, tilling, harrowing, cultivation, fertilization and other operations must be accomplished with the help of mechanical traction; in the sowing stage also there are a number of related specific operations: preparation of the seed or plant material, transporting the seed to the field, delivery to the seeder or planting machine, etc, all of which assumes production of a number of diverse machines.

Inter-furrow cultivation (usually several times), plant nourishment, loosening the soil (deep cultivating), repeated watering of irrigated agricultural regions, struggle against

plant blight, etc., are all performed with the help of machines in the crop handling stage. All this is possible only when there is available a large number of diverse automatic machines.

A large fleet of the most intricate machines are required for complete, continuous harvesting, especially of large commercial crops.

Since the stages in the agricultural production process of each crop or group of crops proceed successively, the operating machines are apportioned to soil processing, planting, harvesting, etc. A battery of machines is used for soil preparation and subsidiary work; for development work, irrigation, snow retardment, fertilizer application, etc. All this demonstrates the extent to which the problem of introducing complete mechanization into agriculture is complicated and the level of the technical equipment it demands.

As we have already noted, each crop or group of crops must have its own corresponding bank of machines. However, this does not exclude the fact that the same machines may be used, in many cases, for the cultivation of various crops, especially the soil processing and sowing machines: plows, seeders, harrowers, cultivators, intricate processing machines, etc. A portion of these, the more or less general purpose machines, are used extensively in the cultivation of the most diverse crops. However, also in this group are found the extremely specialized machines: the seeder designed for the sowing of one particular crop, planting machines, surface plows and other specialized plows, etc.

The harvesting machines and mechanisms are the most highly specialized and varigated. There are, nevertheless, general duty units among this group of machines, for example, the grain-harvesting combine, which is used not only for the harvesting of grain (ear, spike) crops, but with the aid of relatively uncomplicated attachments is also used in harvesting a number of other valuable crops: sunflower, soya, coriander, mustard, millet, seed grass, etc.

Therefore, with the creation of a bank of agricultural machines designed with a view to complete agricultural mechanization, it is necessary to consider the mechanization requirements of all the separate operations in the cultivation of each crop, and thus facilitate assemblage of the appropriate set of diverse automatic machines.

"A system of machines, in the proper sense of the word, is a substitute for the single, independent machine only when the object of labor goes through a consecutive series of interconnected individual processes, which are carried out by a chain of dissimilar yet reciprocally complementary automatic machines." (K. Marx, Kapital, Volume 1, 1951, page 385.) According to this Marxist conception, mechanization in socialist agriculture fundamentally has already been accomplished. All the most important and most labor-consuming processes in soil treatment and sowing, in crop handling and harvesting, are conducted in our country on the basis of modern first-rate technology -- with the aid of tractors, combines and other intricate agricultural machines and

implements. In 1951 about 70 percent of all field work on the kolkhozes was performed by tractors and machines of the (MTS). These facts bear witness to the absolutely predominant role of mechanical, power-driven labor over unmechanized or as yet insufficiently mechanized labor. If one keeps in mind all the interconnected yet individual operations indispensable for carrying on farming in keeping with the demands of Soviet agrotechnical science, and relates them to the number of operations currently being performed on the basis of machines actuated by motive power, then the resulting relation indicates the extent to which the conduct of agriculture on the basis of motive power has been achieved. (It stands to reason that manpower will always play a part in agricultural production, especially in individual types of work, for example, in servicing the needs of intrafarm hauling. However, the decisive place in agriculture already belongs to motive power, and its significance will grow uninterruptedly.)

This achievement at the present time amounts to no less than 75 percent of the individual processes. This means three quarters of the individual operations in agriculture may be performed by power-driven machines. Mechanization of the remaining 25 percent is, in essence, the problem of developing extensively the present applicability of mechanization.

Marx points out, that "the more developed the mechanization, the more uninterrupted is the process carried out by it, that it, the more that raw material passes from the first to the last stage of the productive process with less gaps, the more it will necessarily move from one phase of production to another directed not by man but by machinery." (K. Marx, Kapital, Volume 1, 1951, pages 386 - 387). The development of a system of machines in a socialist

agriculture is being accomplished for this purpose.

The problem of introducing complete mechanization consists, in the first place, in expanding existing mechanization in all agricultural zones and regions of the country and, by so doing, liquidating the existing zonal variations in the level of mechanization between the South and North, between regions of grain and specialized crop production, between arid and irrigated agricultural regions, between regions subjected to drought and those of sufficient and excessive moisture, etc. In the second place, the problem of complete agricultural mechanization consists in gradually mechanizing the still unmechanized fractional agricultural processes. It does not follow, however, that the final moment of complete mechanization will result in mechanization of the last individual operation. Such a time undoubtedly will come, but in any given stage in the mechanization process it is necessary to mechanize the overwhelming majority of individual operations in a given farm, district, region, or zone, as well as the most important and most labor-consuming ones. Just, for example, as the task has been set currently in Kuban. In the third place, the problem of complete agricultural mechanization consists of improving the existing park of diverse automatic machines and engines employed in agriculture, striving for their greater productivity and, consequently, for their greater economy and efficiency. This applies first of all to those automatic machines from which existing technical deficiencies still have not been eliminated. However, this is a constant and general problem beyond the limits of the immediate practical measures in setting up complete mechanization.

The following four basic production processes may be distinguished in complete mechanization of labor-consuming tasks in livestock raising: (1) fodder extraction (fodder procurement and ensilage); (2) fodder preparation; (3) handling of the livestock; (4) livestock output recovery. Each of these specified operations is, in turn, divided into a number of separate, isolated operations.

Computation shows that the extent of mechanization of all the individual labor processes in livestock raising is already at least 70 percent of the total number of separate operations in this field. Therefore, one might assume that basically the bank of machines for mechanizing the labor-consuming cattle-raising processes has also been established. However, industry is still manufacturing an insufficient number of such machines. The kolkhozes are slowly becoming familiar with these machines and are using them to some extent.

In livestock raising, unlike farming, the four basic production processes do not follow in consecutive order. Caring for the livestock goes on constantly; feed preparation for one type of animal being continuous (for sheep, and for cows in stall and during summer pasturage), and for others -- during the stall period; output in some cases is received often during the course of a year (milk) and only in isolated cases (shearing sheep) -- once or twice a year. Only fodder extraction -- procurement and ensilage -- is conducted in definite agricultural periods. In livestock raising,

as in farming, the working period does not coincide with the time of production. However, while in farming the bulk of the labor is expended during the season of field work which is conducted on large tracts of land, in livestock raising, labor expenditures are distributed more uniformly during the course of a year and the tasks are performed with approximately the same number of workers, mainly on farms.

This substantial difference, which explains the special mechanization features of livestock raising's labor-consuming processes, requires other organizational forms of the power base of production.

Mechanization of the most important processes and the application of a bank of agricultural machines are realized fundamentally on the basis of mobile power -- heat tractors (operating on internal combustion engine); in the future, this will be achieved also on the basis of tractors supplied with electric motors (electric tractors) receiving their power from a central power plant. Stationary work has comparatively less significance in agriculture: sorting and grading grain, the initial processing of flax, drying of agricultural products, etc.

The most important labor-consuming processes in cattle raising are mechanized mainly on the basis of stationary power (electric, gas, steam, and wind mill driven engines), which constantly sets in motion the whole system of diversified automatic machines on cattle farms: machines for water supply, fodder preparation, transportation of fodder, clearing manure from cattle

yards, milking cows, etc. The electric motor with group or individual drive, obtaining energy from a single power plant, is the engine which best meets the requirement of cattle farm mechanization. In fodder extraction the mobile engine is practicable and indispensable -- fuel or electric tractors. The extensive use of the electric motor for mechanizing the labor consuming work on cattle farms must, undoubtedly, be combined with the use of engines operating on local fuel (gas-generator or steam plants) or which use the energy of the wind (windmill-driven generators).

The whole bank of machines for accomplishing the complete mechanization of crop production and livestock raising is based on the combination of two types of power -- mechanical and electrical. (The question of the use of heat energy, which has great significance in the development of crops and plants, and consequently plays a basic biological role, depends upon a particular type of investigation.) In different developmental stages of agricultural production these two forms of power are used in different proportions. Agricultural mechanization was begun on the basis of tractors and, first of all, in the mobile agricultural processes. At first tractors were used almost exclusively for field work and scarcely at all for stationary jobs. At the present time, electric power, basically used in stationary work especially on cattle farms, is being more widely introduced in agricultural production. Gradually the process of apportioning production among various jobs is being determined by the form of power. Mobile jobs are accomplished on the basis of tractors with internal combustion engines, stationary jobs -- on the basis of electricity and various mechanical plants: gas-generator, steam and windmill-driven. There will

be widespread use of mobile tasks in production to the extent to which agricultural electrification is developed, new electric power stations are set up and the currently existing output of electrical power is increased.

At the moment, the use of electric tractors is in the experimental-demonstrating stage. In the future, the proportion of mechanical and electrical power used in agriculture will change somewhat; electricity will have a more decisive significance, with mechanical power playing a smaller role. Already the Soviet agricultural machine-building industry must consider the necessity of producing automatic machines designed for the use of both mechanical and electrical power.

In developing a bank of machines for achieving complete mechanization of farming and livestock raising in the postwar years, our agricultural machine-building industry achieved huge successes. The tractor park was substantially changed. It was supplemented with more perfectly designed machines which have greater operating possibilities. The chain-tread diesel tractor is becoming the basic type of motive power. By 1951 the tractor park capacity of the MTS alone (excluding the sovkhozes) increased one and a half times in comparison with 1940, during which time the efficiency of the chain-tread tractors more than doubled and that of the diesels increased more than 7 times.

The tractor, with a diesel engine and operating on chain-tread with increased speed, is distinguished by its high efficiency and productivity.

Socialist agriculture sets up tractor pools which fundamentally solve the problems of complete mechanization of all productive branches of agriculture, taking into account climate, soil and other characteristics of the country's separate economic regions. Together with this, electric tractors of original Soviet design are being introduced into production.

During the postwar years a park of diverse harvesting machines not previously used has been created. Beetroot, flax, and potato-harvesting combines were designed, tested, and accepted for mass production. Also, different problems in the mechanization of cotton harvesting were solved. Now our agriculture is setting up a whole bank of machines, among which are self-propelled machines, for harvesting irrigated and unirrigated sowings of cotton plants, for harvesting squares (unopened bolls), for clearing the fields of stubble (cotton plant stalks). Intricate flax-threshing machines, pulling machines equipped with a bundling apparatus, and other harvesters of various types were accepted for production and are being successfully employed. Tests of reapers for harvesting fiber crops are being conducted successfully. The greatest achievement of Soviet agricultural machine building is the creation of a system of harvesting machine for the most important commercial crops, fodder crops and potatoes. Until recently the harvesting of commercial and some other crops presented the most difficulties and required huge manpower expenditures. The insufficient number of harvesters led to a prolonging of the harvest period, to an increase in waste, etc.

The grain-harvesting combines were radically improved. More perfectly designed combines, the Stalinets-6, the self-propelled

combine S-4, replaced the old-type, grain-harvesting combines. The new types possess greater productive capacity, they have improved threshing units and harvesting apparatuses. The Stalinets-8 Combine is running successfully through tests calculated on the harvest of high-harcest districts, which yield 30-35 centners and more per hectare.

The park of soil preparing, sowing and planting, sorting and screening machines, as well as the drying plants, have been expanded and perfected. Cotton-cleaning machines, cotton-drying plants, machines for sorting grain, etc., are being introduced.

There has been extensive development of machines for carrying out diverse meliorative work, and especially labor-consuming work.

A system of machines for mechanizing labor-consuming work in livestock raising was developed and production begun, first of fodder-procurement machines. At the present time, industry is expanding production of machines and implements for complete mechanization of all work in grain harvesting and fodder ensilage. The use of power-driven, coupled- and trailer-tractor-mowing machines, tractors with transverse and lateral rakes, scrapers, selective picking machines, haystackers, and other machines and implements, makes it possible to mechanize grain harvesting from the cutting of the grain to the stacking and pressing. Recently the introduction of ensilaging machines and corn-harvesting combines has quaranteed the full mechanization of fodder ensilage. (The corn harvesting combine gathers the cobs and mows the stalks, and simultaneously grinds the stalks and transfers the ground bulk to the silo.)

Intricate machines and mechanisms are being used on cattle farms for mechanizing fodder preparation (fodder pulverizers and steamers), water supply and irrigation, intrafarm transport, milking, shearing sheep, well excavation, construction of ensilage pits, etc.

In connection with measures for fulfilling the great Stalin Plan for the transformation of nature, the park of machines of the sovkhozes and MTS is supplemented not only with special machines for forest cultivation, but also with machines for reservoir and well construction, and for road construction.

In the postwar period the agricultural machine-building industry began to produce more than 150 new types of highly productive machines, which permitted more extensive mechanization of agricultural production processes. There is especially wide use of machines for the inter-furrow and inter-nest cultivation of sowings, and for harvesting those furrow-plowed crops which were previously harvested mainly by hand.

The number of mechanized types of work in agriculture doubled in comparison with 1940. Until the war, the MTS had performed 90 different types of work on the kolkhozes on the basis of mechanized, tractive power, mostly in field work. Today, they perform more than 170 different jobs, not only in field production work but also in other branches of agriculture -- livestock raising, reforestation, dam and reservoir construction, etc. The process of completing the technical revolution in all socialist agricultural production, in all its branches and sections, is now taking place. Also in process is the rapid accumulation of diverse

automatic machines for the enveloping mechanization of all the individual operations in farming and livestock raising, and for the transition to complete mechanization in all agricultural production.

In the future this will lead to the elimination of the existing differences in the level of technical equipment in industry and agriculture. In the relatively near future, agricultural labor will become completely mechanized labor, i. e., labor managed and controlled by machines. Only those differences between industrial and agricultural labor are preserved, which are determined by the peculiarities of agriculture in such a branch of the economy where the land is outstanding in the quality of the most important means of production and where production is tied up with living organisms.

At the present time, in addition to the 150 types of agricultural machines already mastered and widely employed, about 300 machines of modern design are being developed with a view to complete agricultural mechanization.

Every year thorough tests of new and different type machines are conducted; experimental models which are tested under conditions appropriate for the various zones of the country. In 1950 more than 1,000 machine models of modern types and designs were tested. In 1951 more than 1,200 such machines were tested, of which more than 400 new models were manufactured by the plants of the Ministry of Agricultural-Machine Building. Many of these machines are now being produced, while the designs of others are being perfected. In 1951 more than 30 designs were recommended for production, either in experimental lots or in large-scale.

Important changes in the development of the productive strength of socialist agriculture occur as a result of the measures taken for carrying out the Stalin plan for the transformation of nature.

Field-protecting forest cultivation, afforestation of watersheds, ravines and vallies, fastening of sand, reforestation along river banks and reservoirs, the introduction and utilization of a grass crop rotation system of agriculture -- all this changes the climatic conditions, increases the cultivation of agriculture, allows natural regeneration and creates economic productivity of the soil, guarantees high and steady harvests, forms a solid feed base for raising the social livestock industry and for raising its productivity, and leads to the multifold development of the economy of the kolkhozes.

Together with this, investments (perennial planting, dam and reservoir construction, irrigation and soil improvement, etc.), actualized in accordance with the plan for the transformation of nature, raise the level of intensive farming and introduce enormous changes in the stage of agriculture's productive strength.

The new level of productive power in socialist agriculture could not effect new phenomena in the organization of agricultural production. Technical progress created the conditions which made possible the mass movement for the voluntary unification of comparatively small kolkhozes into large kolkhozes. In the process of unification of the small kolkhozes there occurred simultaneously, both the strengthening of the economy, and the further

growth of the material-productive base, which guarantees fulfillment of the most important tasks in the transformation of nature, especially in a grass crop rotation system of agriculture, in the improvement of social, productive livestock raising and in the development of rural electrification.

As a result of consolidation, the number of kolkhozes in the country was reduced more than 2 times, while simultaneously, the average size of the individual farm increased. At the present time in the country as a whole, on each kolkhoz, on the average, there is two and a half times more plowed land and three to four times more common livestock than in 1950.

One of the existing features of socialist agriculture is the possibility and necessity of the transition of its present degree of development and technical equipment to a larger-scale production, to a still higher degree of concentration of the means of production and of collective labor. At a certain stage, consolidation of the kolkhozes becomes an economic necessity, since the insufficient size of the individual economies might otherwise hinder further inculcation of modern technology and its highly efficient use in the interests of further increasing the productivity of agricultural labor.

The high level of technical equipment of the MTS is the real material foundation, thanks to which the consolidation of the kolkhozes at a new level of concentration of the means of production and of labor has been fully accomplished. The MTS attained

such a degree of development when they were able to take over the servicing of all kolkhozes, without exception, and to begin inculcating complete mechanization in all agricultural branches.

The economic necessity of consolidating the kolkhozes was determined first of all by technical progress, while unification became the most important prerequisite for constructing the material-technical base in the country, which is appropriate for the period of transition from Socialism to Communism.

The MTS are also, at a given stage of kolkhoz construction, an important means of control in the transition of the kolkhozes to a higher degree of concentration of production and labor, and consequently, an important means of control over their further consolidation -- economically and organizationally.

The most important prerequisites for achieving complete mechanization of all of its branches are created in socialist agriculture. A system of machines has been established, fundamentally, which solves the problems of complete agricultural mechanization. Consolidation of the small kolkhozes has taken place. Agricultural electrification has been widely developed. 1600 new MTS and specialized stations have been organized. The country now has a total of 8680 MTS.

The MTS is the guiding force of socialist agriculture. Their technical equipment is growing uninterruptedly, and their productive activity is expanding unceasingly. The MTS, as the main material-technical base for increasing the productivity of kolkhoz labor, for increasing the volume of agricultural production and

creating in the country an abundance of agricultural products, are successfully solving the problem of providing every type of mechanization to all branches of the kolkhoz economy, and on this basis, they are further strengthening the consolidated kolkhozes -- economically and organizationally.